Ch 24: The Reproductive System, Part 2

pp 723-747

Gonads = ovaries

Gametes = ova (one/month)

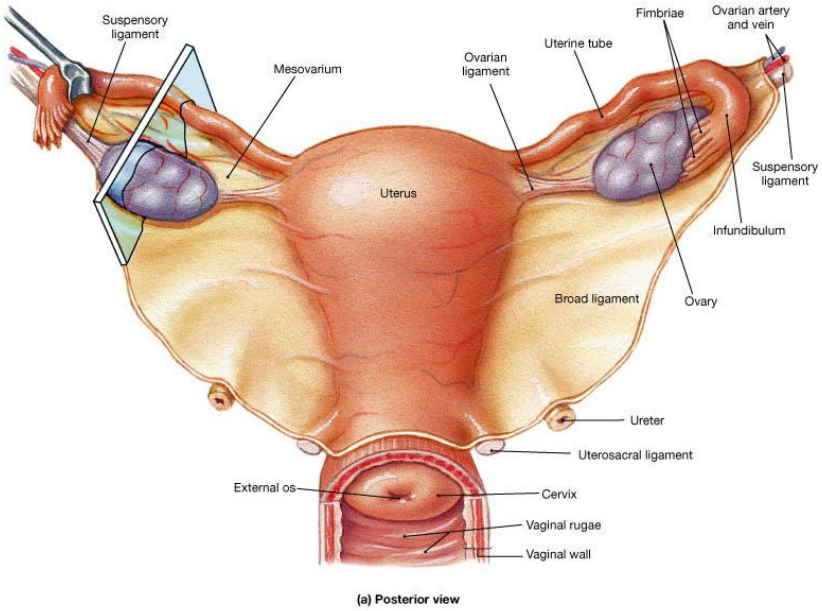
Unlike the male, mostly internal

Female repro system must produce gametes AND maintain developing embryo

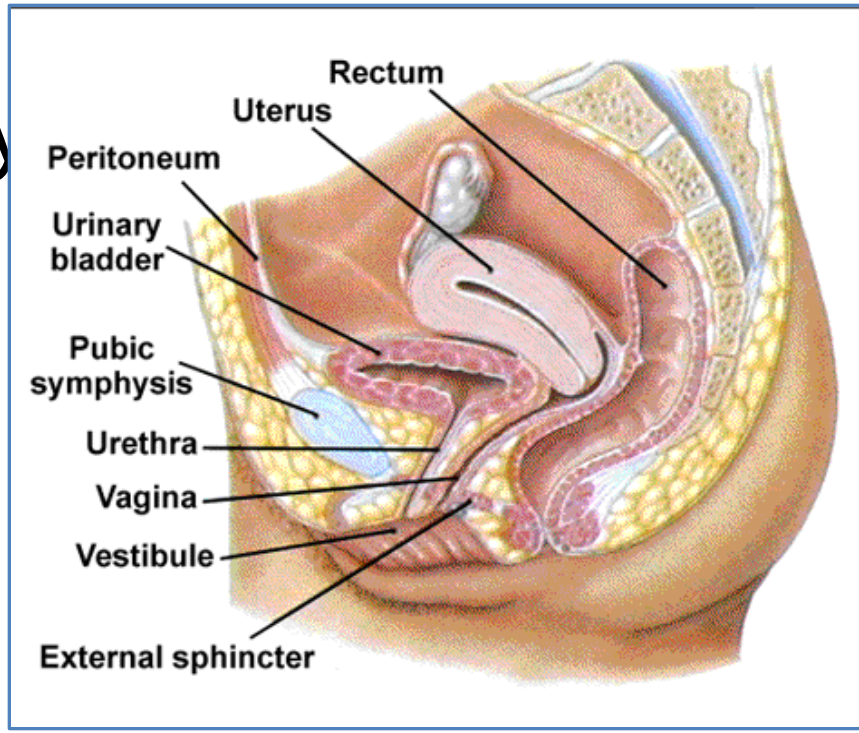
Developed by
John Gallagher, MS, DVM

LAS POSITAS COLLEGE

Overview of Anatomy



(a) Posterior view



Ovaries

Retroperitoneal

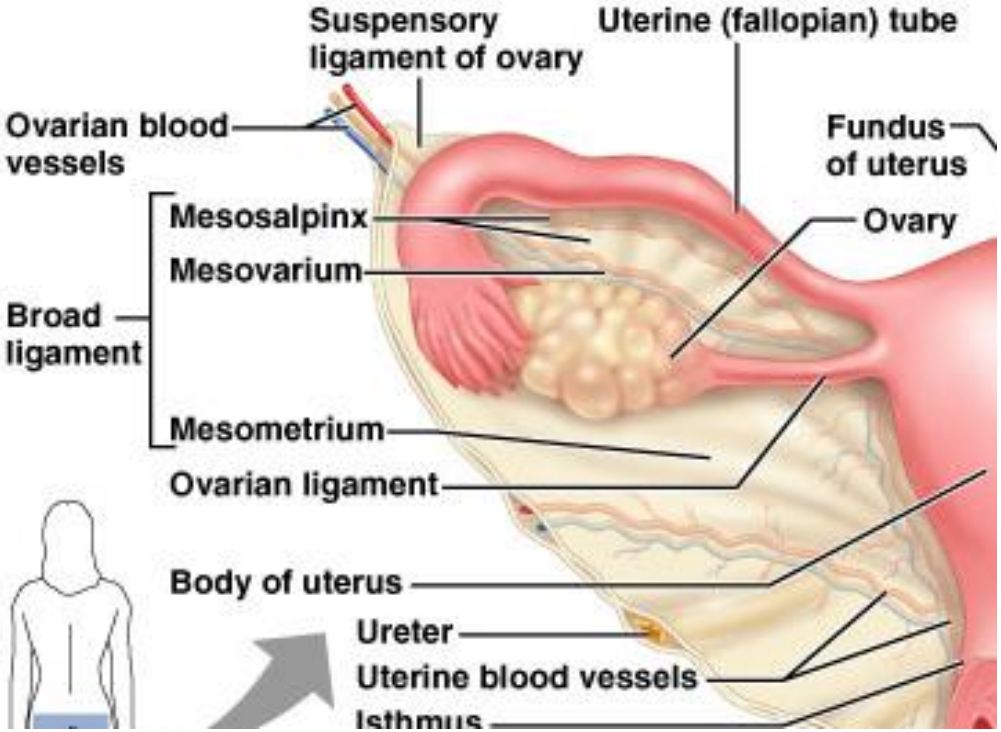
- Broad Ligament
- Suspensory Ligament

Functions:

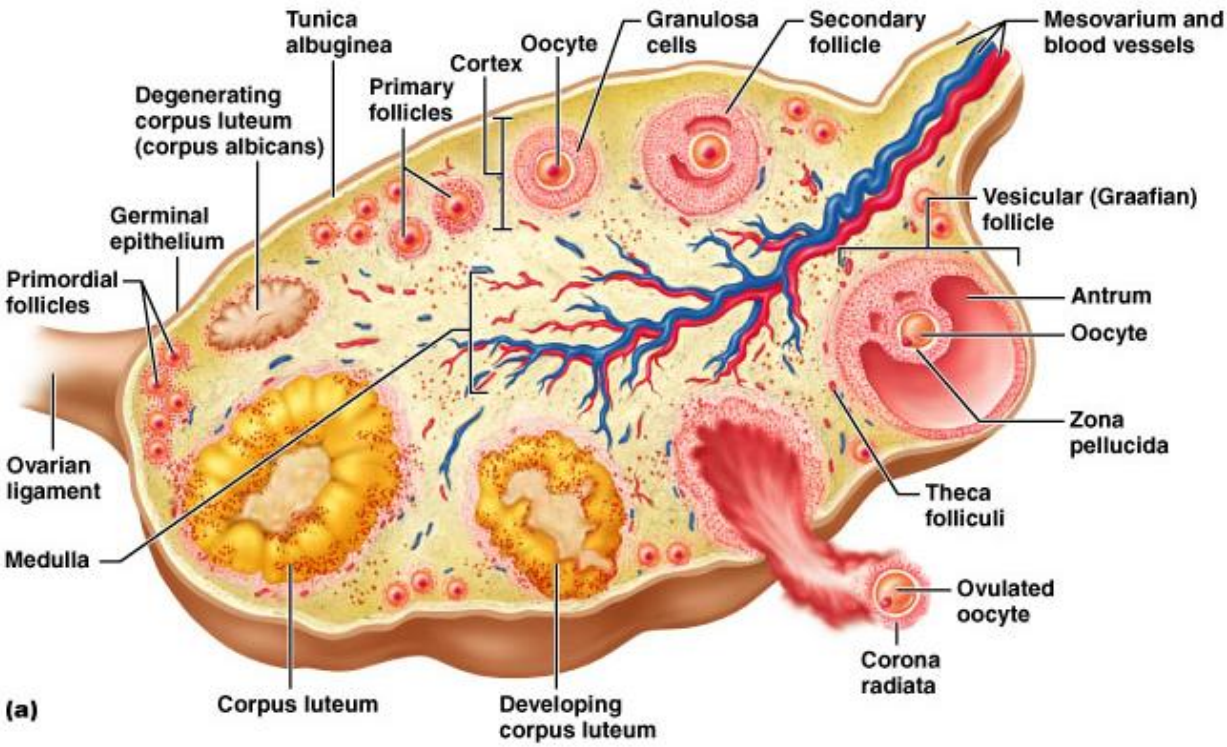
- Ovum production
- Hormone production

Circulation:

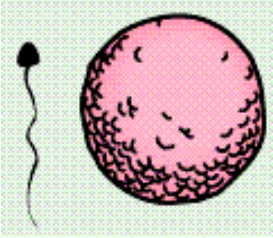
- Ovarian Artery and Vein



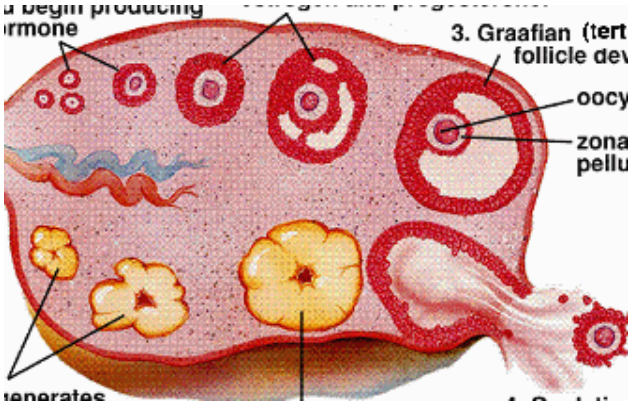
Histology



- Capsule: Tunica albuginea
  - Germinal epithelium (misnomer)
- Ovarian cortex with developing gametes
- Medulla has blood supply



Oogenesis (= ovum production)



Takes place inside ovarian follicles in ovaries as part of ovarian cycle

Oogonia (= stem cells) complete mitotic divisions before birth

- At birth: ~ $2x10^6$ primary oocytes
- At puberty: ~ 400,000 primary oocytes
- 40 years later: 0 (even though only ~ 500 used) $\Rightarrow$ Atresia

Oogenesis

Ovarian cycles start at puberty under influence of estrogen.

Ovulation

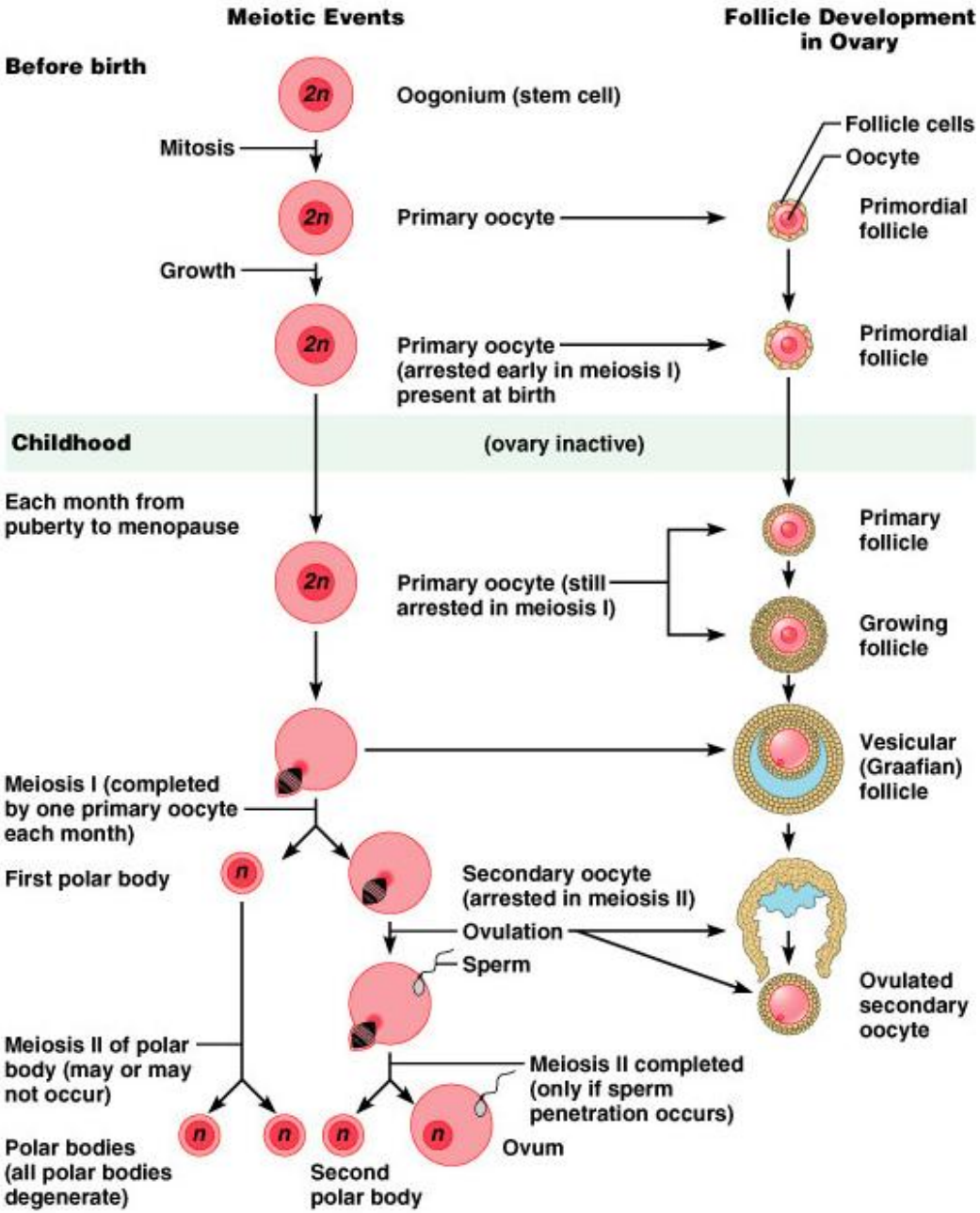
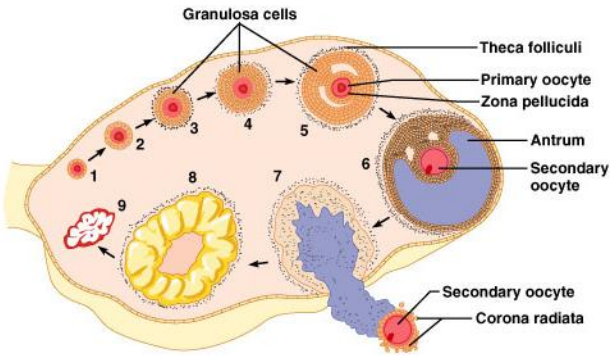


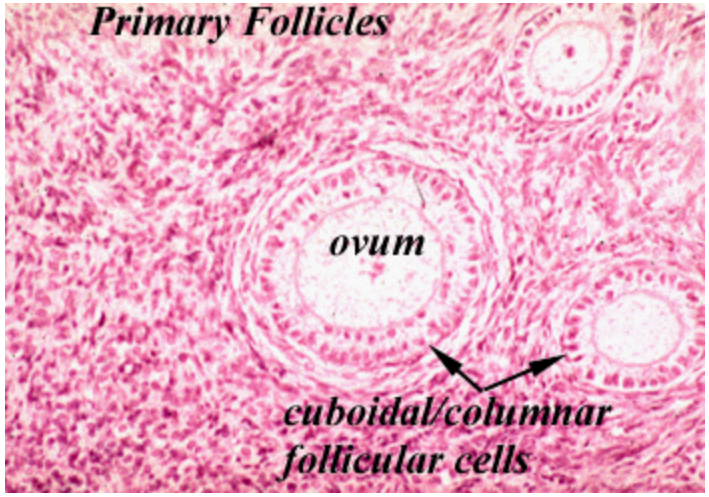
Fig 24.15

Oogenesis

1. Primordial follicle

1. **A dormant stage, ready to develop**
2. **Each month some proceed**
3. **Most (99%) atrophy (atresia)**

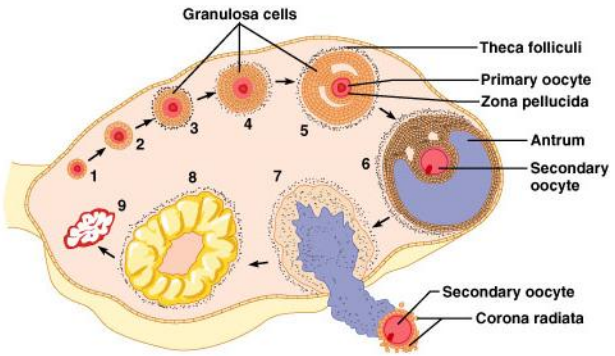


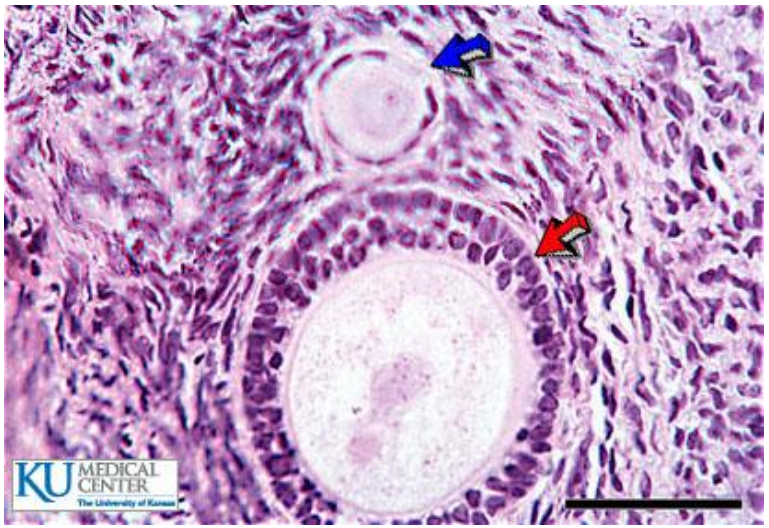


Oogenesis

2. Primary follicle (days 3-8)

1. **Double layer of theca cells**
2. **Enlargement due to estrogen**
3. **More atresia**

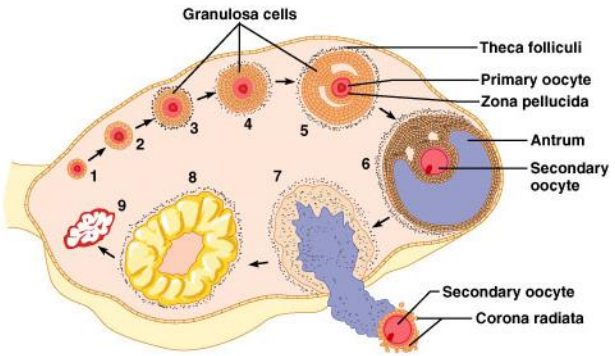


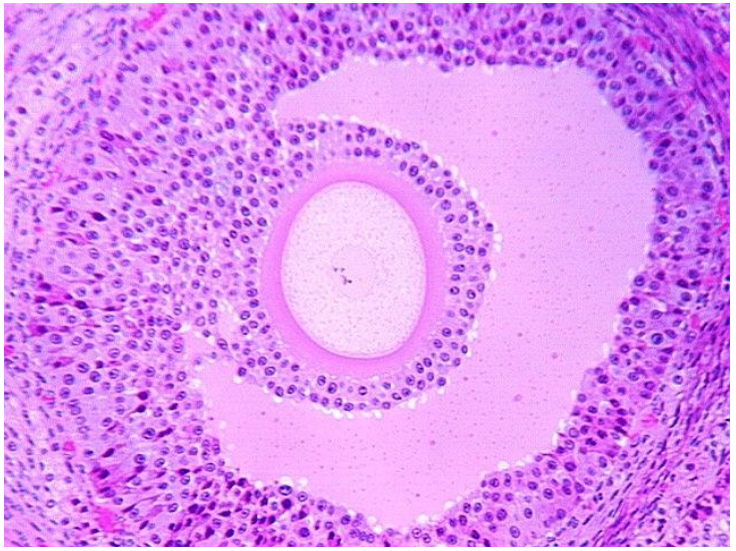


Oogenesis

3. Secondary follicle (days 8-10)

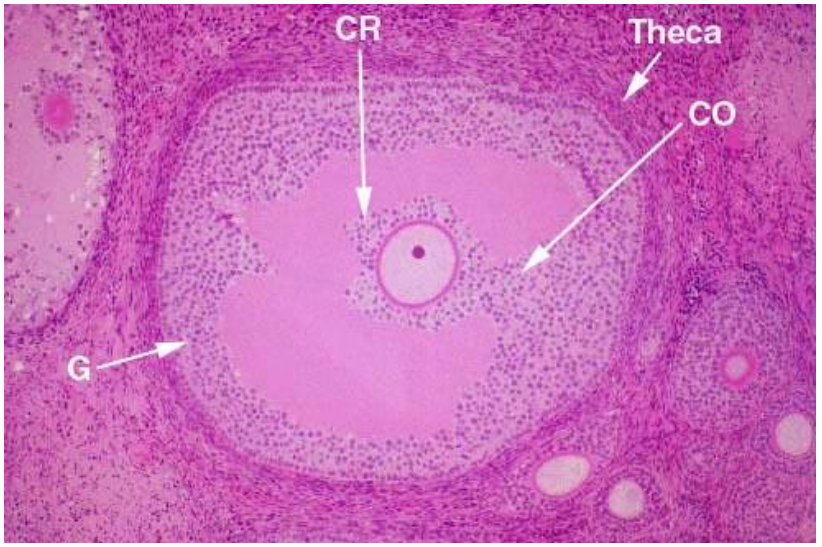
1. **Liquor folliculi appears**
2. **Theca more developed**
3. **Granulosa cells producing estrogen, under influence of FSH**
4. **Zona pellucida visible**





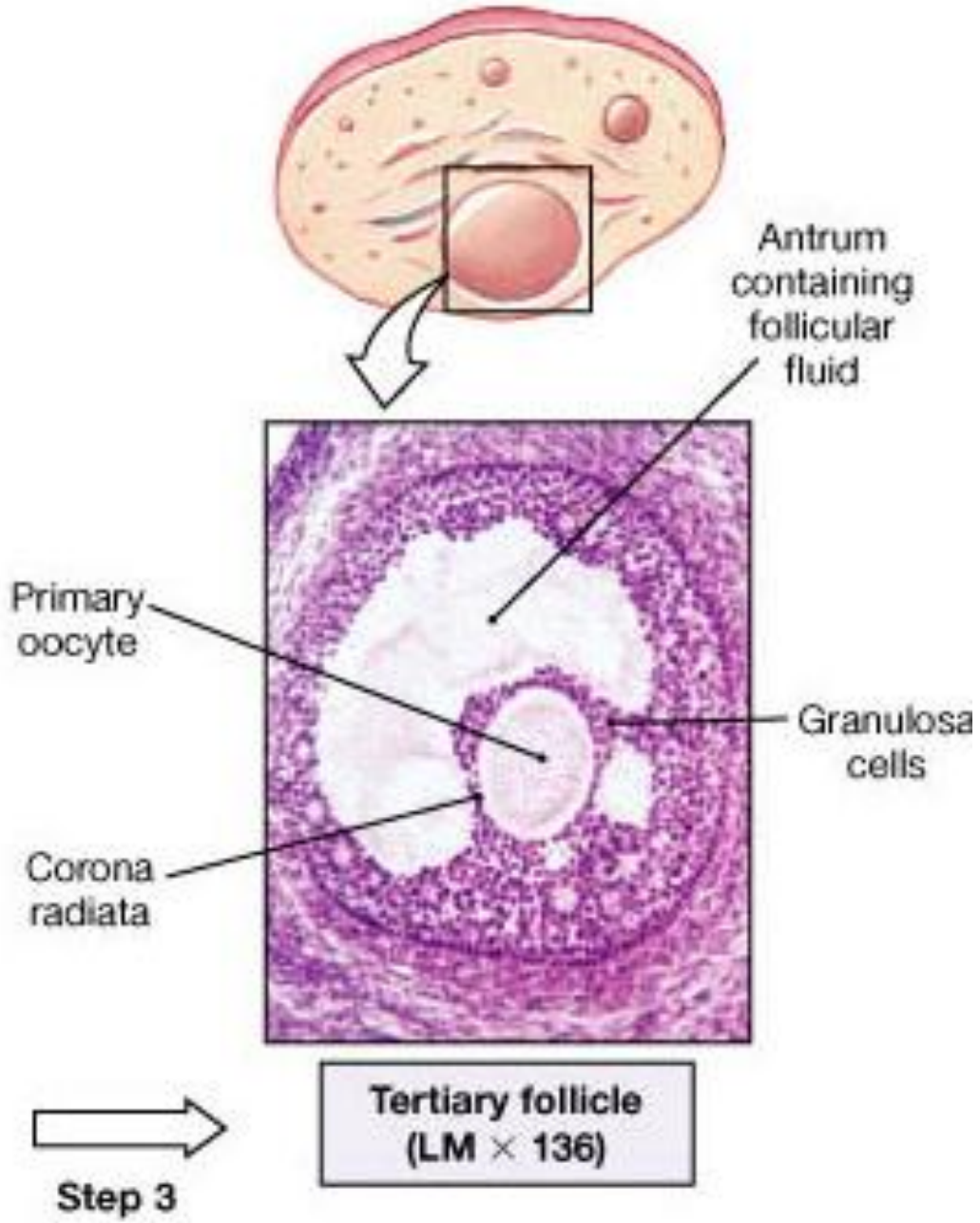
Oogenesis

4. **Tertiary (Graafian or vesicular) follicle (days 11-14)**
    1. **Ready for ovulation**
    2. **Theca well developed**
    3. **Granulosa cells secreting estrogen**
    4. **First meiosis completed**



- CO = Cumulus oophorus
- G = Granulosa cells
- CR = corona radiata

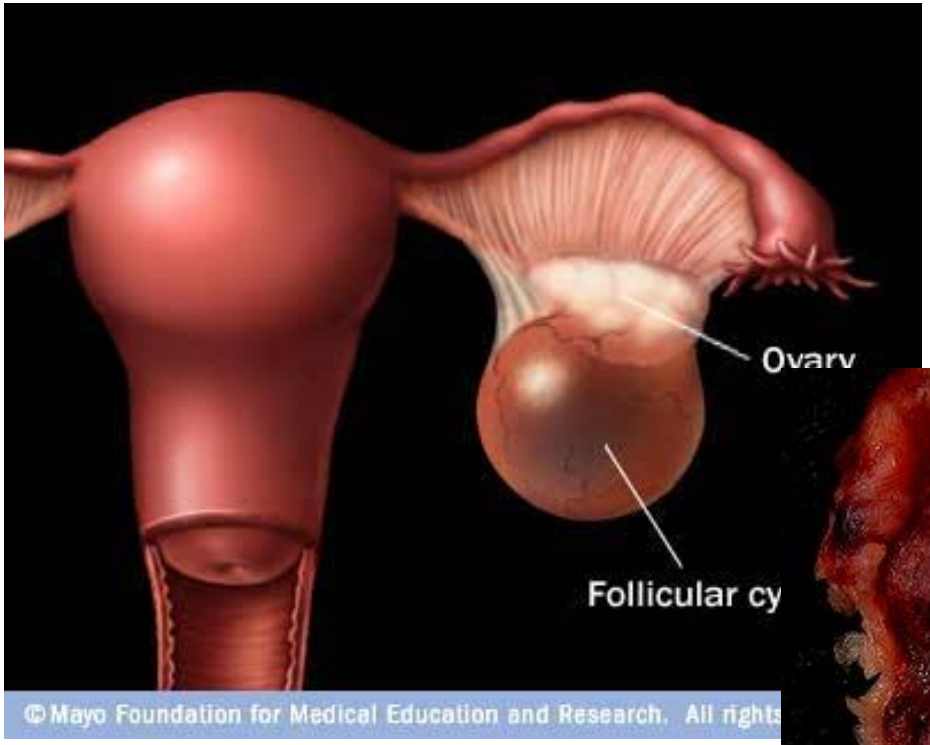
Tertiary or Graafian Follicle



Spans entire width of cortex

First meiotic division being completed: 1°oocyte divides into one 2° oocyte and one polar body

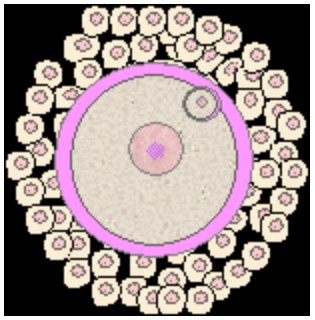
Ovarian cyst



Cyst = bag, usually filled with fluid

Usually follicular or luteal cysts.

Ovulation



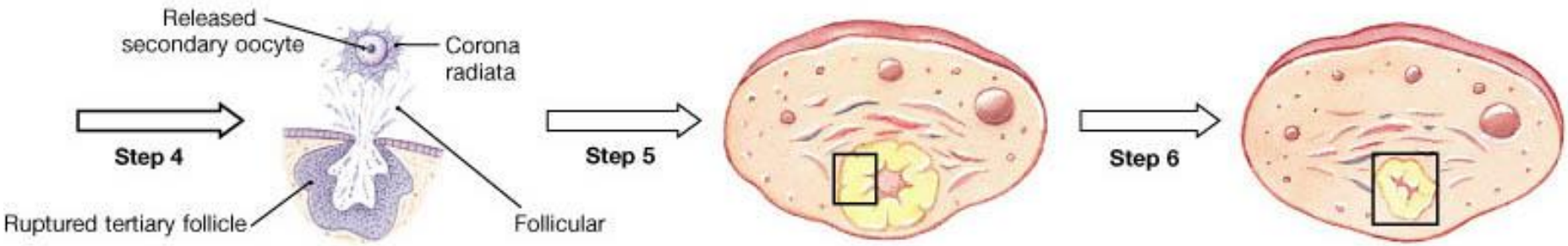
Oocyte and follicular cells shed into abdominal cavity and collected by fimbria

then

1. **Empty follicle forms corpus luteum which produces progesterone**

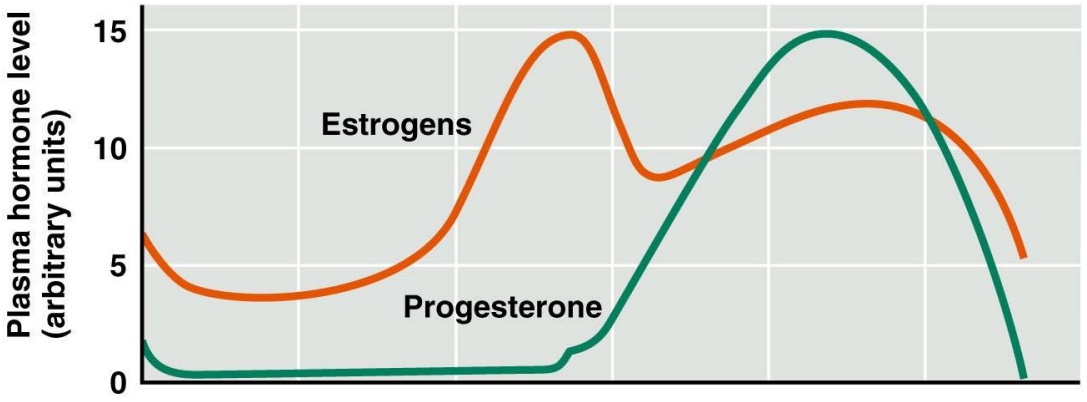
2. **Corpus luteum degenerates and becomes corpus albicans**

3. **GnRH increases under low estrogen and progesterone levels**



Menstrual Cycle

- Day 1: first day of menses (period)
- Days 7-14: Proliferative phase
  - Follicle develops, secretes estrogen
- Day 14: Ovulation
- Days 14-28 (luteal phase):
  - Corpus luteum forms from follicle, secretes progesterone, eventually becomes corpus albicans



(c) Fluctuation of ovarian hormone levels

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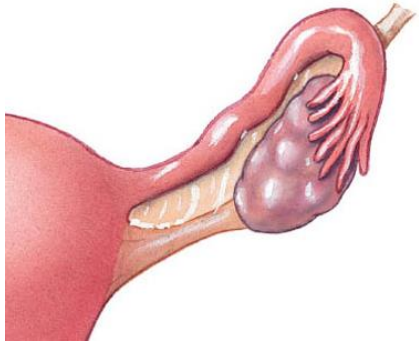
Uterine Tube

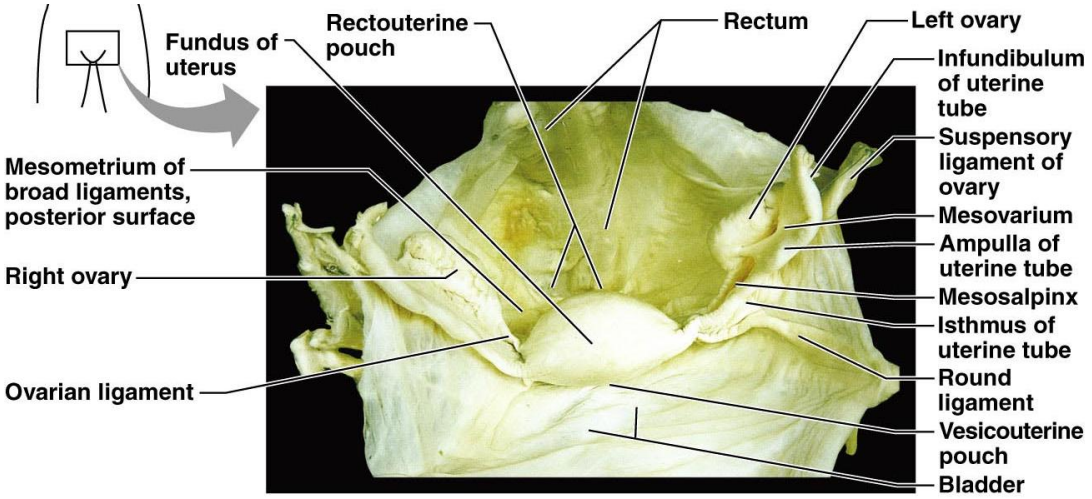


= Fallopian tube =

oviduct = salpinx

Infundibulum with fimbriae

- **Ampulla (place of fertilizatior**
- **Isthmus**
- **Intramural portion**



Most common site of ectopic pregnancy

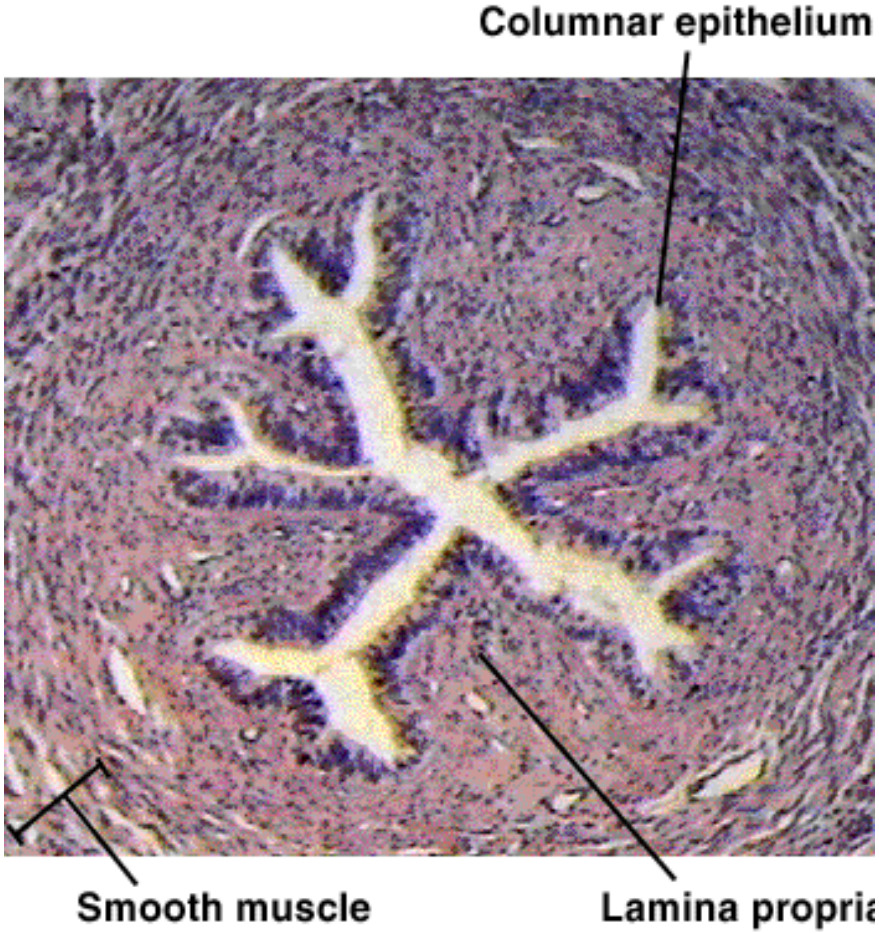
Tubal ligation

Uterine Tube Histology

Ciliated and non-ciliated simple columnar epithelium

Ciliary movement and periodic peristaltic contractions move ova

Secretion of nutrient substances



The Uterus = Womb

Fundus, Body, Isthmus, Cervix

Uterine wall ~ 1.5 cm

made up of

1. Endometrium,
2. Myometrium,
3. Incomplete perimetrium (visceral peritoneum)

Blood supply

- Uterine arteries from internal iliac
- Ovarian arteries from abdominal aorta (inferior to renal arteries)

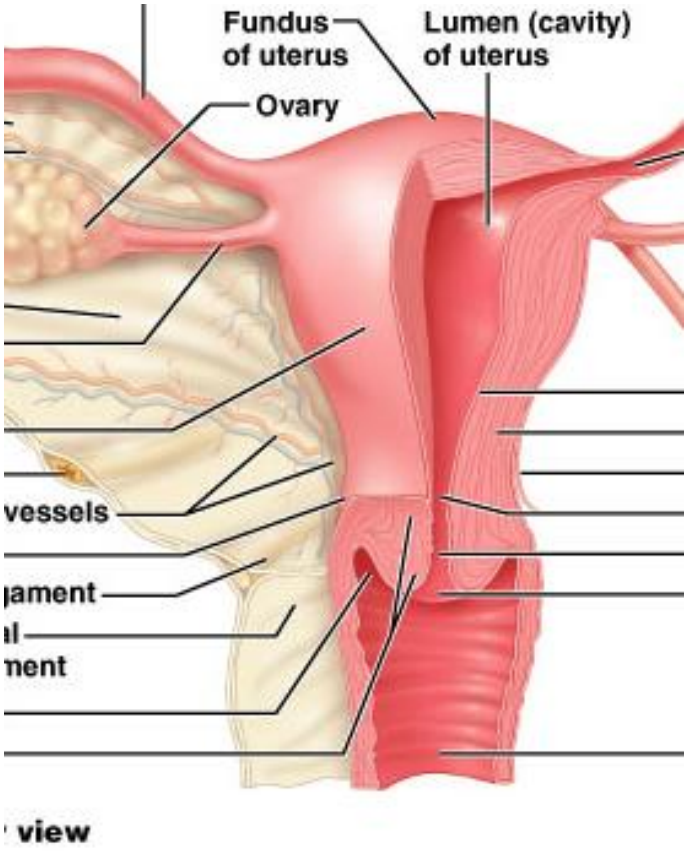
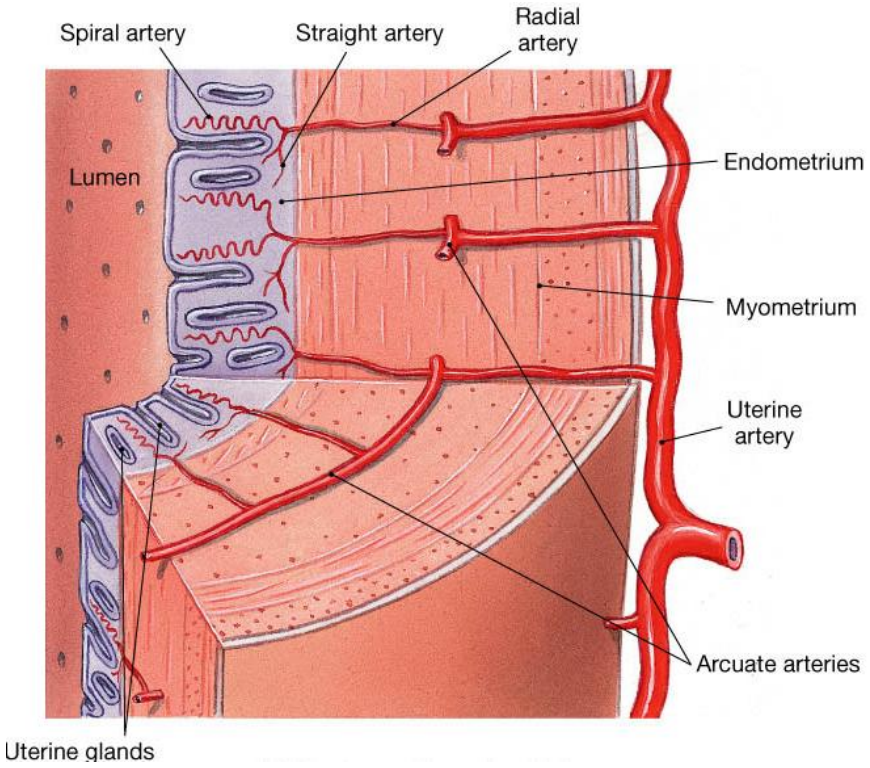


fig 24.11

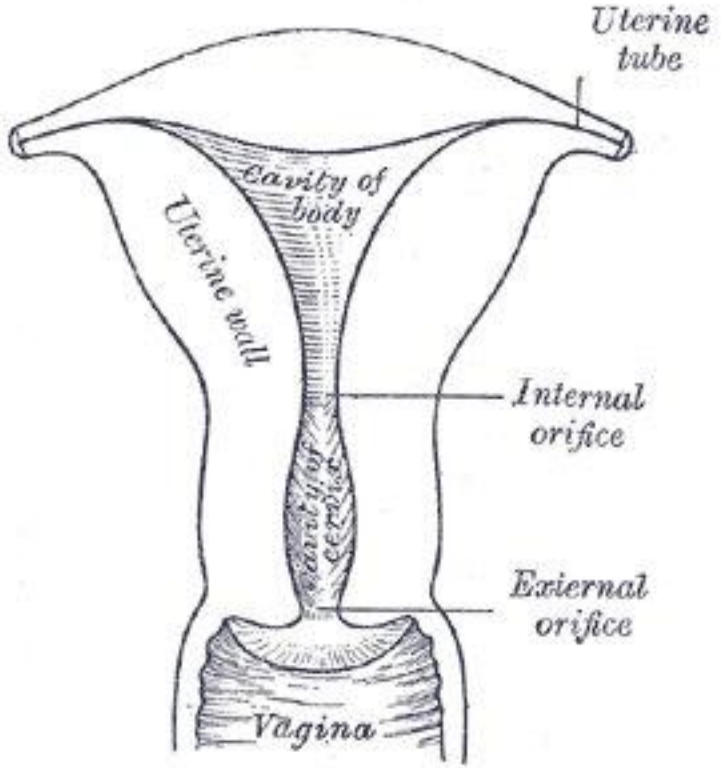
Histology of Endometrium

- **Functional zone** – deciduum, sheds during menses
  - menstruation - flow sheds functionalis layer of endometrium
  - proliferative phase - under influence of estrogen basal cells proliferate
  - secretory phase - progesterone maintains functionalis
- **Basilar zone** – permanent layer, deep to functionalis



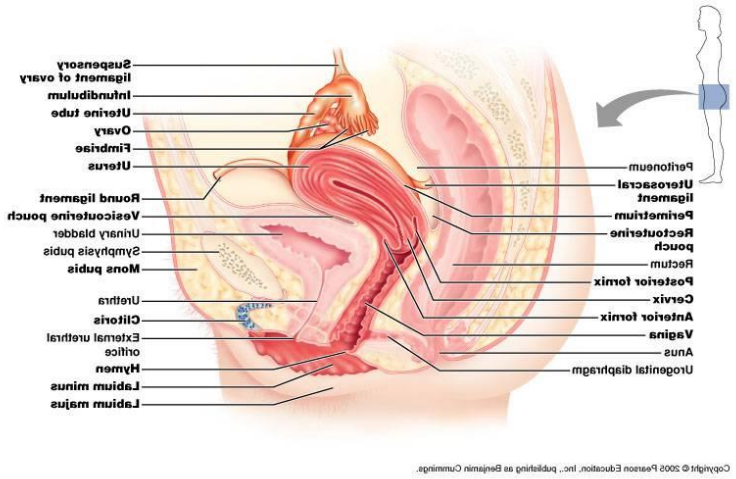
Functions of Uterus

- **Protection of embryo/fetus**
- **Nutritional support**
- **Waste removal**
- **Ejection of fetus at birth**



Cervix and Vagina

- **Cervix** attaches to vagina at ~ 90° angle
  - Fibrous connective tissue
- **Fornix** – pocket surrounding uterine (surgical access to pelvic cavity; locat birth control device)
- **Vagina** – fibro-muscular tube servin
  - receptacle for intercourse
  - passageway for menstrual products
  - birth canal
- **External genitalia**
  - Labia majora and minora
  - Clitoris
  - Urethral papilla



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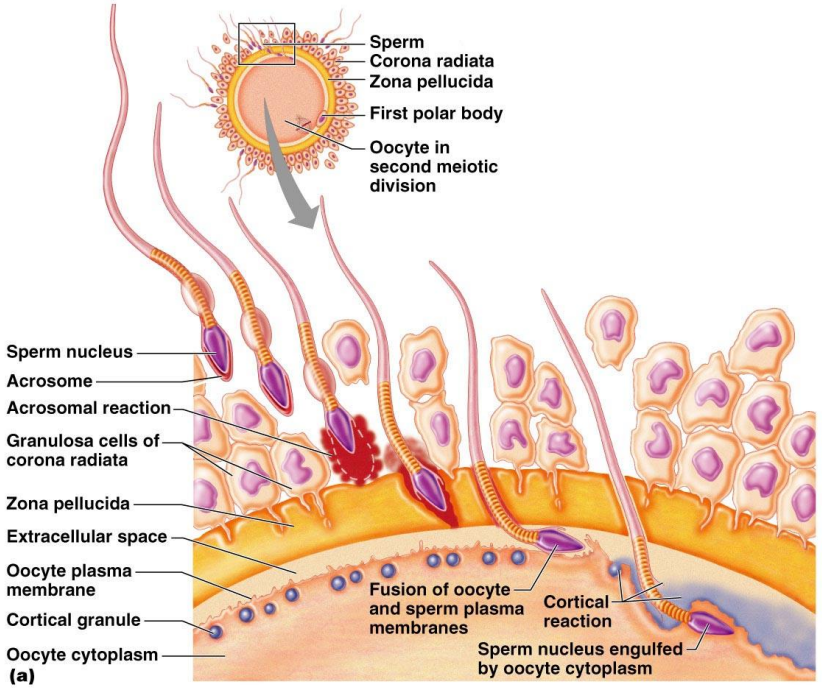
Fertilization

- Acrosomal Reaction
  - Enzymes in acrosome dissolve part of zona pellucida
- Cortical Reaction
  - Destroys receptors for further spermatozoa
- Fertilized zygote enters uterus at ~ day 4



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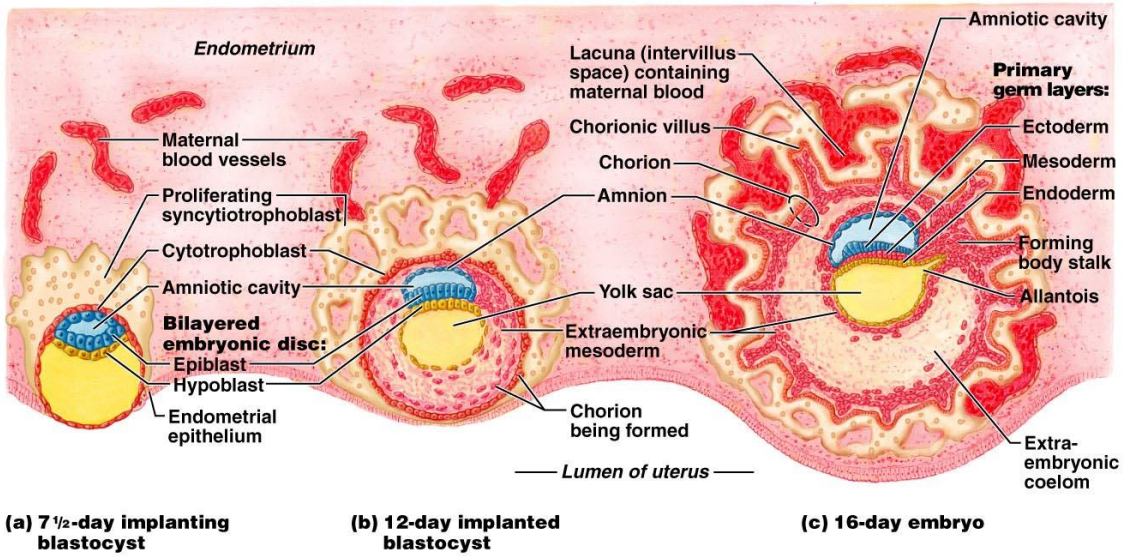
Pregnancy

- Implantation (day 6)
  - Blastocyst + trophoblast
  - Loss of zona pellucida
  - Trophoblast proliferates
  - Attachment to endometrium



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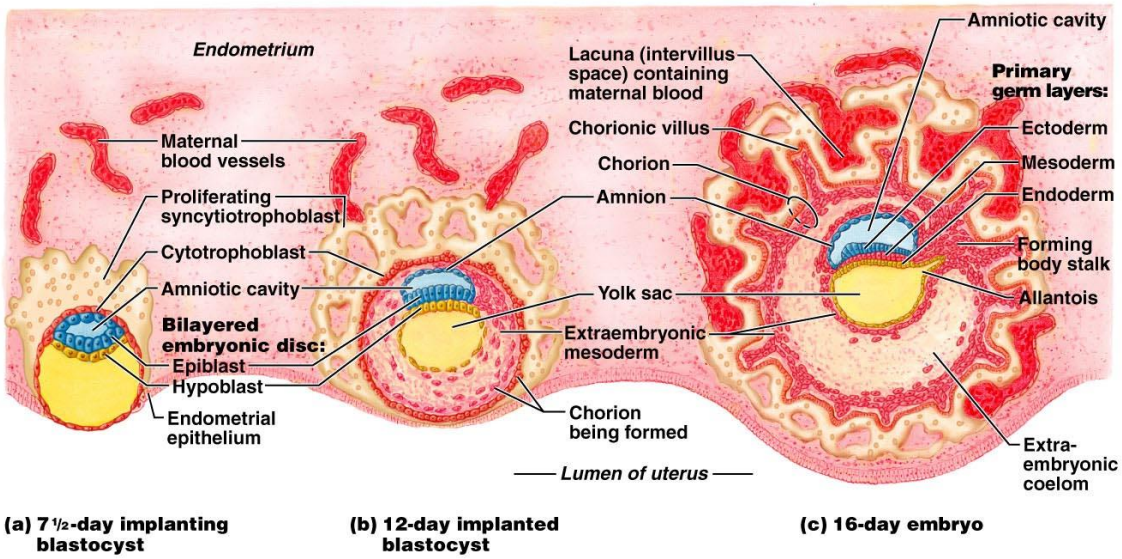
Pregnancy

- Placenta
  - Formed from trophoblast and endometrum which is now called the chorion
  - Chorionic villi contact maternal blood supply

- becomes an endocrine gland:
  - HCG (similar to LH) maintains the CL for 3 months
  - Later, estrogen and progesterone
  - Relaxin and human placental lactogen
- Provides nutrition and waste removal



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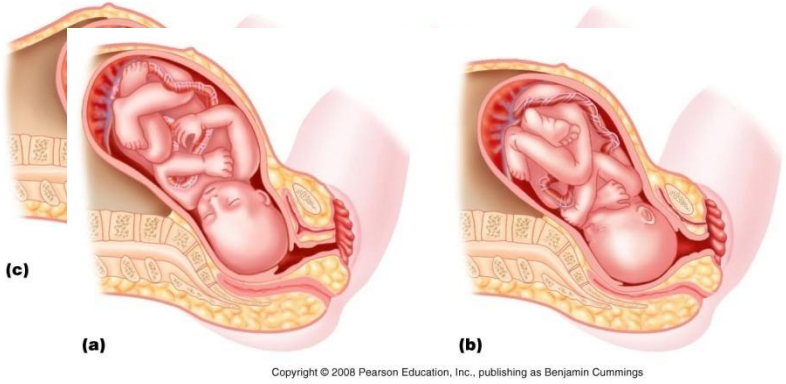
Parturition

- Gestation ~ 280 days (266 days after last menstruation)
- Stages
  - Dilation
  - Expulsion
  - Placental



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The Mammary Gland

Modified sweat gland, holocrine secretion

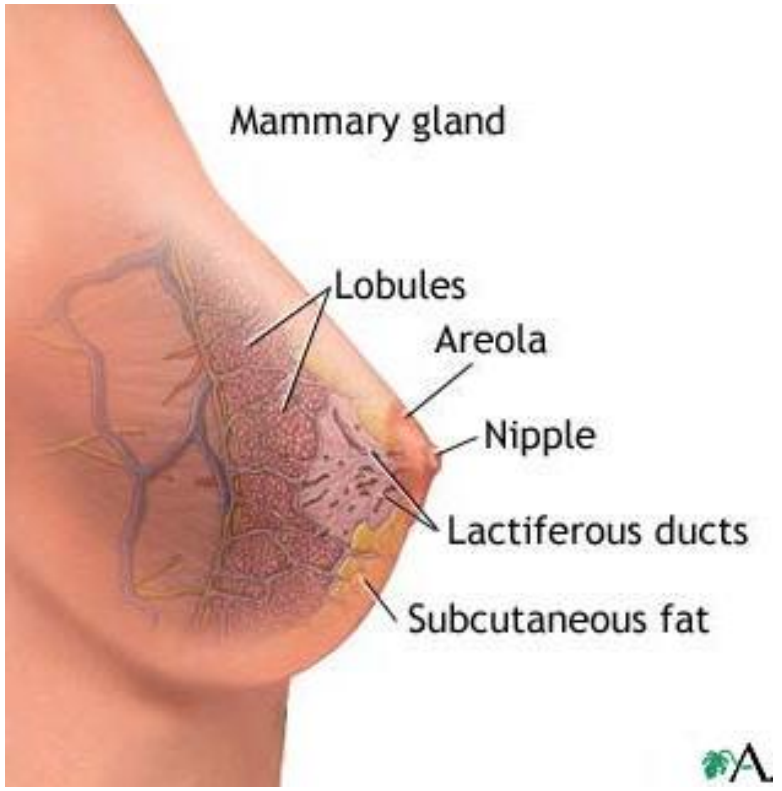
Overlaying the pectoralis major muscle

15-20 separate lobes separated by suspensory ligaments; each lobe contains several secretory lobules

Lactiferous ducts **leaving lobules; converge into 15-20 lactiferous sinuses**

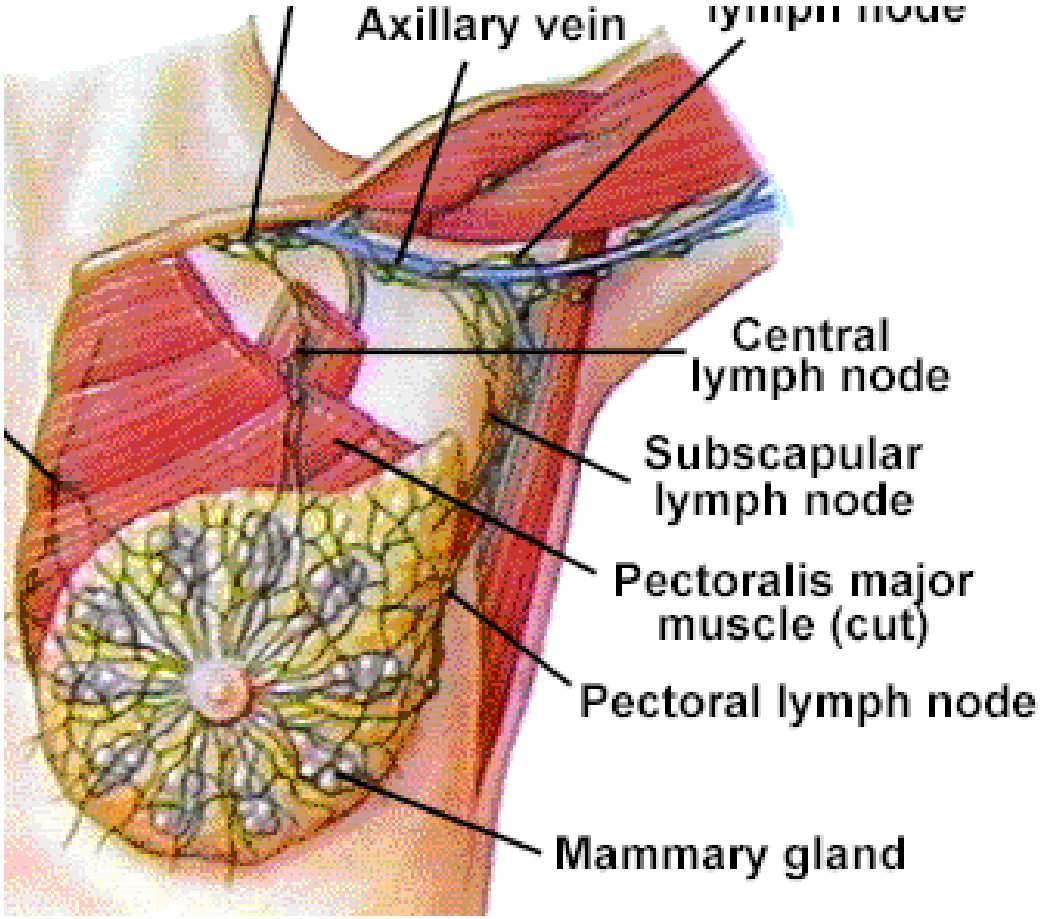
Site of most breast cancers

Milk stored in lactiferous sinus until released at tip of nipple, influenced by oxytocin



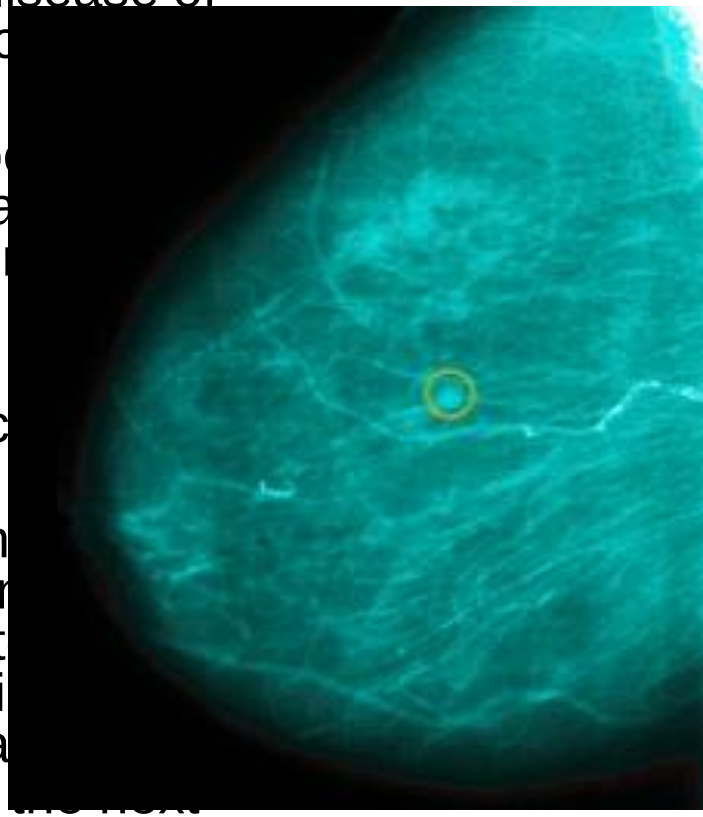
Lymphatic Drainage of Mammary Glands

. Is of considerable clinical importance, why ??

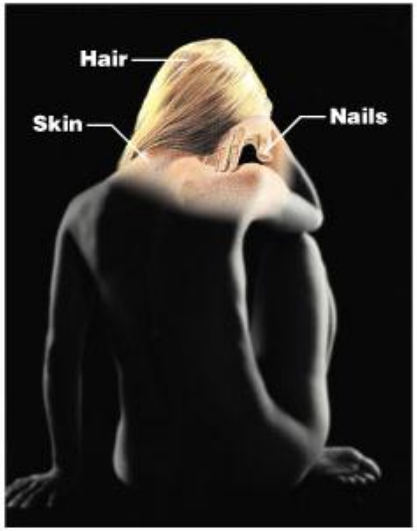


Breast Cancer

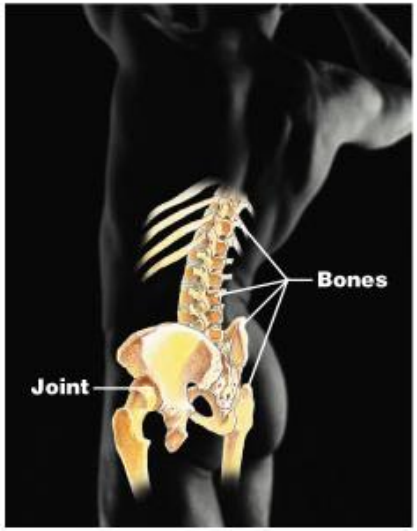
- Although breast cancer is primarily a disease of women, about 1% of breast cancers oc men.
- Breast cancer is the most common typ in women and is the second leading ca death by cancer in women, following o cancer.
- In 2000, the American Cancer Society that 184,200 new cases of breast canc diagnosed in the United States.
- The average woman at age 30 years h chance in 280 of developing breast ca next 10 years. This chance increases t for a woman aged 40 years , and to 1 i age 50 years. A 60-year-old woman ha chance of developing breast cancer in 10 years.
- DCIS or IDC



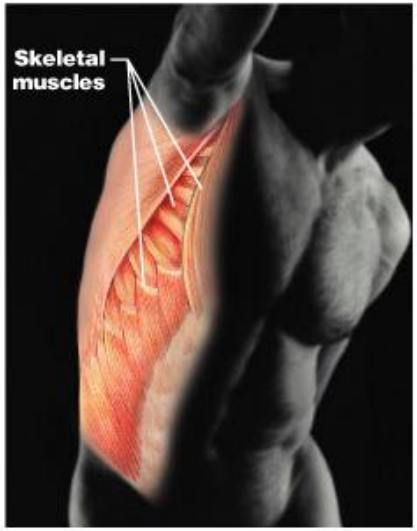
The Systems



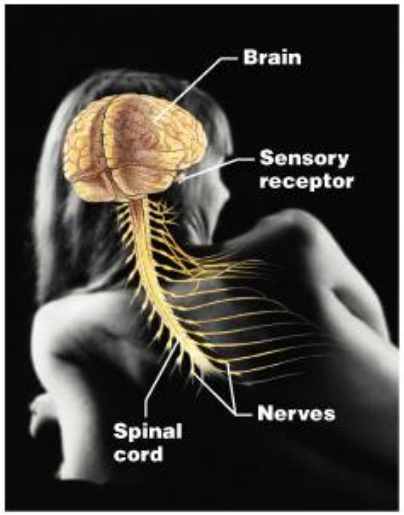
(a) Integumentary System
Forms the external body covering; protects deeper tissues from injury; synthesizes vitamin D; site of cutaneous (pain, pressure, etc.) receptors, and sweat and oil glands.



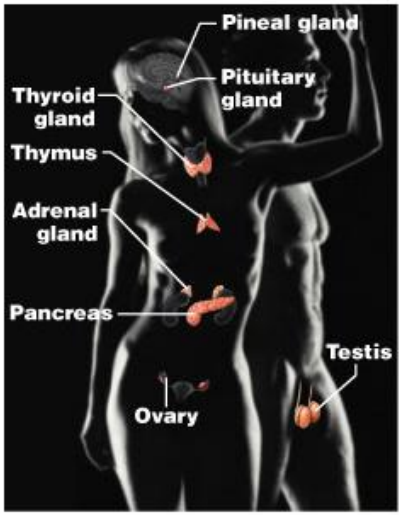
(b) Skeletal System
Protects and supports body organs; provides a framework the muscles use to cause movement; blood cells are form



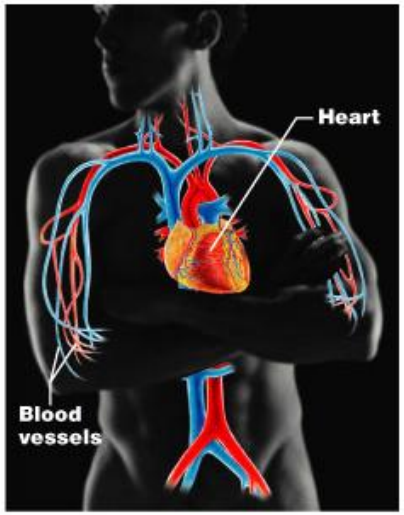
(c) Muscular System
Allows manipulation of the environment, locomotion, and facial expression; maintains



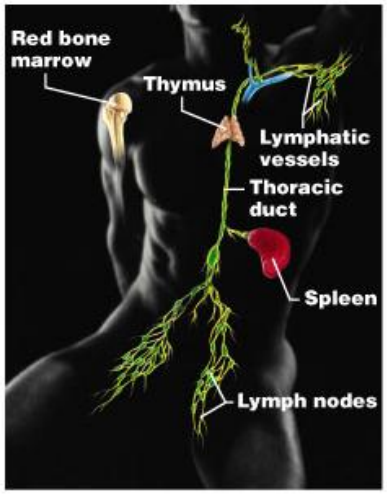
(d) Nervous System
Fast-acting control system of the body; responds to internal and external changes by activating appropriate muscles and glands.



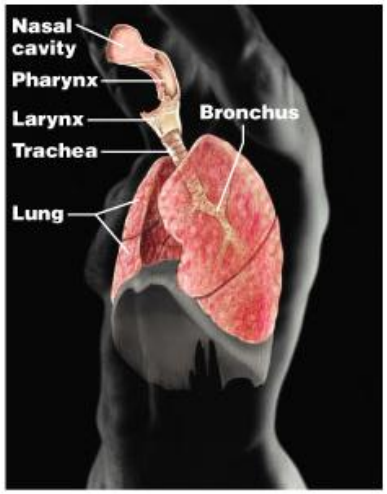
(e) Endocrine System
Glands secrete hormones that regulate processes such as growth, reproduction and nutrient use (metabolism) by body cells.



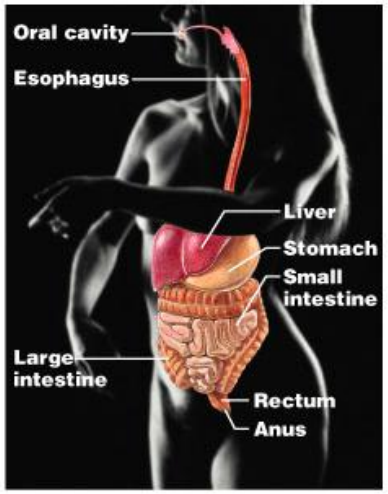
(f) Cardiovascular System
Blood vessels transport blood, which carries oxygen, carbon dioxide, nutrients, wastes, etc.; the heart pumps blood.



(g) Lymphatic System/Immunity
Picks up fluid leaked from blood vessels and returns it to blood; disposes of debris in the lymphatic stream; houses white blood cells (lymphocytes) involved in immunity. The immune response mounts the attack against foreign substances within the body.

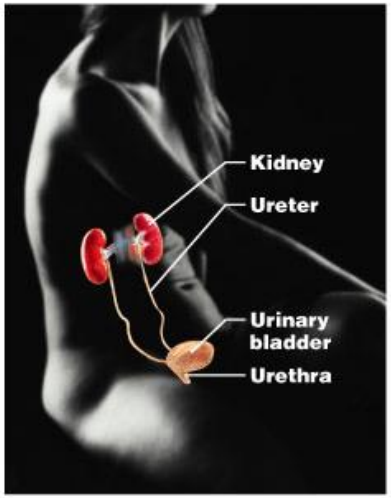


(h) Respiratory System
Keeps blood constantly supplied with oxygen and removes carbon dioxide; the gaseous exchanges occur through the walls of the air sacs of the lungs

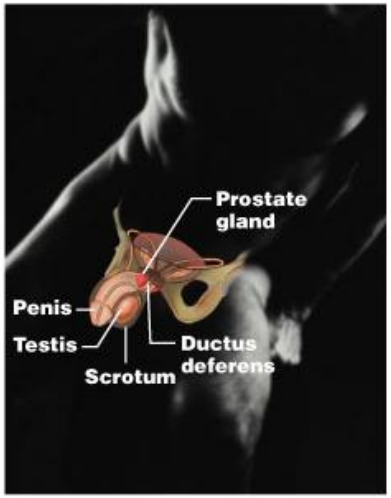


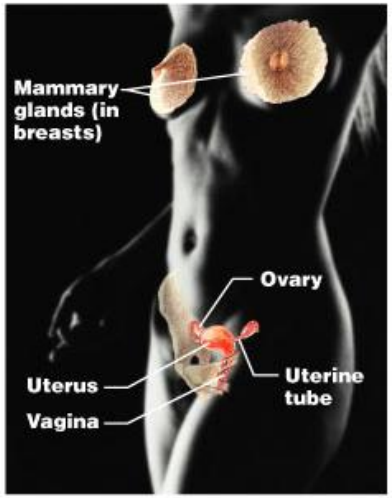
(i) Digestive System
Breaks down food into absorbable units that enter the blood for distribution to body cells; indigestible foodstuffs are eliminated as feces

Repetitio est mater studiorum!



(j) Urinary System
Eliminates nitrogenous wastes from the body; regulates water, electrolyte and acid-base balance of the blood.





(k) Male Reproductive System **(l) Female Reproductive System**
Overall function is production of offspring. Testes produce sperm and male sex hormone; ducts and glands aid in delivery of sperm to the female reproductive tract. Ovaries produce eggs and female sex hormones; remaining structures serve as sites for fertilization and development of the fetus. Mammary glands of female breasts produce milk to nourish the newborn.